The Newsletter of
the Australian and
New Zealand Society
of Paediatric
Dentistry

Synopses

May 1998, Issue 17

Glass Ionomer Cements

Alan Chow
Winner of the 1997 Undergraduate Essay Competition

What Are Glass Ionomer Cements?

Glass ionomer cements were introduced in 1972, originally designed for restoration of anterior teeth, erosion cavities, general cementation and as base/lining materials. (Wilson & Kent 1972). However, today the use of GIC as a restorative material lies mainly in the field of pediatric dentistry.

Classification

GIC is defined as "a cement that consists of a basic glass and an acidic polymer which sets by an acid-base reaction between components." (McLean et al 1994) GIC is classified as follows: (Mount 1991)

- Type I luting cements
- Type II .I restorative aesthetic
- Type II.2 restorative reinforced
- Type III lining cements

Aim

The uses of GIC in pediatric dentistry generally include three areas: prevention, bonding and as a restorative material in both primary and permanent dentitions. (Kilpatrick 1996) However in this essay, our discussion will mainly focused on the restorative uses of GIC in children and adolescents. The success rate of various types of GIC restorations will also be compared with other materials.

Criteria in Selection of Restorative Material in Pediatric Dentistry

Due to the limited lifespan of primary teeth; the different anantomy of primary molars and the level of co-operation, concentartion and co-ordination of children, the criteria in the selection of a restorative material in pediatric dentistry is different to that of general restorative dentistry. (Kilpatrick 1993, 1996)

Because of the difference in the structures and characteristics between primary and permanent teeth, the requirements for a restorative material in primary teeth do not exactly match those of permanent teeth. Several requirements for restoration in primary molars had been deduced: (Hickel & Voss 1990)

- intention of restoration is to conserve teeth until exfoliation;
- higher occlusal abrasion of primary teeth;
- higher failure rates of restorations due to more difficult management of children;
- as an interim until a proper restoration is accepted by children.

Properties of GIC

GIC as a restorative material is adhesive to both enamel and dentine, hence preventing marginal microleakage; can be packed, carved and polished easily and readily; (Fuks et al 1984) minimises tooth preparation ; prevent recurrent caries due to its fluoride releasing property. (Welbury et al 1991). These properties are all lacking in amalgam and composite resins, which prompt the use of GIC as a restorative material in pediatric dentistry.

To utilise GIC, successfully, its properties and characteristics must be understood. The characteristics of conventional GIC include the followings: (McLean et al 1994)

- hard substance upon setting;
- low-reaction exotherm;
- no polymerisation shrinkage;
- no free monomer present;
- dimensional stability at high humidity;
- filler-matrix interaction;
- adhesion to enamel and dentine
- fluoride release;
- early moisture sensitivity requiring protection immediately after placement.

Fluoride Releasing Property

Besides the ease of handling, the fluoride releasing property of GIC is its most popular advantage, and also prompts its use in pediatric dentistry as a restorative material. This property is important in the reduction of recurrent caries. (Sepet et al 1995) GIC is

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Coming Events

September, 1998
Professor Edwina Kidd - RK Hall Visiting Lecturer
Melbourne, Brisbane, Adelaide, Perth
Contact local branch secretaries

19-21 March, 1999
10th International Dental Trauma Conference
Melbourne

2-4 September, 1999
International Association of Paediatric Dentistry Congress
London

Inside

President's Report

The very first, and most important, task of an incoming President is to acknowledge a job well done by the previous Administration. For me, in my first term as President of the ANZSPD, it really is a great pleasure to thank and compliment Dr Bernadette Drummond on her performance as President. Bernadette travelled Australia and New Zealand speaking at all Branch Meetings and, in some cases, providing whole day courses. Bernadette has set a wonderful example as President being readily available on the phone or by Email and always being fair and reasonable in her deliberations. I wish her all the very best, both in her new exciting home adventure and with her extensive teaching responsibilities at the University of Otago. I would also like to thank Dr Alastair Devlin who, as always, is both the left and the right hand of any President.

In Dr Drummond's last Newsletter she mentioned the bid by the ANZSPD to host the 2003 IAPD Meeting in Sydney. As members will know our bid was considered in Argentina at the IAPD Board Meeting. The Board decided to await its next meeting in June of this year before making a final decision. Two cities left in the running were New Orleans and Sydney. Both bid organisations were asked to provide answers to several questions from the Board's Site Selection Committee prior to the final deliberations in June.

On the political front there are certainly many interesting issues that are canvassed regularly in our ADA newsletters. Two particularly interesting areas that I will report on later are the Senate Enquiry into Public Dental Services being conducted by the Federal Government in Australia and the planned Review of the Dental Act in Victoria, which amongst other things will look at the role and definition of a dentist.

On the dental front the ANZSPD Biennial Congress held in Sydney in September in 1997 occupied centre stage. This meeting was very successful with a combination of speakers that proved to be spot on. It was a perfect mixture of clinical, research and technical presentations, very well complemented by local speakers. One important issue that developed during the ANZSPD Council Meeting was the issue of sharing of profits from Society Meetings. The current practice of all profits being remitted to the Federal office generated much discussion. The end result was an undertaking from President Drummond to review the profit sharing rules. Branch Meetings will be asked for their opinion & their response will be discussed at a Board Meeting in Perth during the ADA Congress Meeting. This issue of profit sharing from ANZSPD meetings highlights the need for the Academy to now consider holding its meeting separately. Perhaps like other specialist groups the Academy could consider holding its meetings pre ADA Congress.

Two particularly interesting areas that I will report on later are the Federal Government Senate Enquiry into Public Dental Services and the planned Review of the Dental Act in Victoria

It has always been my contention that clinicians who deal in the paediatric field are always a little more special, in that a strong thread of passion, passion for all things to do with the health and well being of children, is woven into the fabric of their daily lives. I look forward with much enthusiasm both to my Branch visits & the chance as President of the ANZSPD to continue this advocacy for paediatric dental health being recognized as an important part of the total health care of the child population.

Finally, I hope to see you all in Perth, where the local paediatric team have organized a very significant input into the ADA Congress.

Richard P Widmer
President,
ANZSPD

Federal Secretary - Manager's Report

1. 1997 Undergraduate Essay Competition. The topic for this competition was:
"Discuss the current role of Glass Ionomer Cements in restorative dental care for children and adolescents. Include a comparison of the success rates of Glass Ionomer Cements so used with other restorative materials."
The winner was Allan Chow from Sydney.

2. At the Federal Council meeting held at the time of the Society Convention in Sydney in August 1997, it was decided to inaugurate the R.K. Hall Visiting Lecturer programme. This programme will honour Roger Hall, who was the Foundation President of the Australian Society of Dentistry for Children, the forerunner of the Australian arm of A.N.Z.S.P.D.; of course, it will also recognise the enormous contribution Roger has made to the advancement of paediatric dentistry in the world. The first visitor will be Professor Edwina Kidd. 1998 has been chosen as the inaugural year, to coincide with the Silver Anniversary of the Australian part of A.N.Z.S.P.D. which was founded at the 1973 Australian Dental Association Congress in Sydney. The R.K. Hall Visiting Lecturer will become a regular A.N.Z.S.P.D. event, being held the year after each Society Convention

3. There will be a Federal Council meeting at the time of the 1998 A.D.A. Congress in Perth in March. Probably because of the presence of past A.N.Z.S.P.D. President, Peter Gregory, on the Scientific Committee, there is a substantial paediatric dentistry component in the programme. Apart from keynote speaker, Dr Ted Croll, Bernadett Drummond, Louise Brearley-Messer, Peter Wong, Joe Verco, Kerrod Hallett, Margarita Silva, Nicky Kilpatrick, Vicki Farmer, Kareen Mekertichian, Tim Johnston, Pamela Dalgleish, John Winters and Angus Cameron feature in the programme. In addition, Federal President, Richard Widmer will be involved, some might say appropriately enough in the Symposium on Failures, Disasters and Catastrophes in Everyday Practice.

4. Future paediatric dentistry meetings will feature on the Council Meeting agenda. Already listed are the R.K. Hall Visiting Lecturer meetings in Melbourne, Brisbane and Adelaide in September, 1998. The next International Association of Paediatric Dentistry Congress will be in London in September, 1999, whilst the next Biennial Convention of A.N.Z.S.P.D. (our twelfth) will be held in Adelaide between September 1999 and August 2000.

Alistair Devlin
Federal Secretary - Manager
ANZSPD

Branch News

New South Wales

The NSW Branch has had another busy and successful year, the highlight being the National Biennial Congress in August. The meeting attracted almost two hundred delegates who enjoyed some excellent presentations from our three international guest speakers. Goran Dahlloff, of the Karolinska Institute in Stockholm, Kathy Harley from the Eastman Dental Institute and Hospital, London, and Kevin Donly, Centre for Clinical Studies in Iowa together delivered an all encompassing update on the rapidly changing world of dentistry for children.

Current concepts, clinical techniques and practical information were given on topics such as erosion, saliva, hypoplasia, orofacial development and recent advances in dental materials. This was supplemented by presentations from many local speakers.

During the congress the Colgate Award for Postgraduate Student Presentations was judged. Seven very competitive presentations were delivered by postgraduate students from around Australia. Suzanne Brent was the winner of a trip to Sardinia to attend the European Academy of Paediatric Dentistry meeting in March. Congratulations to all the students for some outstanding research.

We have continued to hold our dinner meetings at The Rest Hotel in Milsons Point. Nicky Kilpatrick spoke in March on the phenomenon of tooth surface loss which is appearing with increasing frequency in deciduous teeth. The Interplay of erosion, abrasion and attrition and their management were discussed.

In May, Kerrod Hallett presented an expansive analysis of enamel defects, their prevalence and association with various medical conditions. Two Fifth Year students, Amanda Law and Juliette Scott, gave a brief description of their exchange programmes to Iowa and Minnesota. They were very kindly sponsored by Oral B.

The AGM in November concluded a stimulating year with a presentation by Peter King describing his recent trip to Romania to assist in the provision of dental care to institutionalised children. The Branch Executive remains largely unchanged, but we welcome Derek Mahoney to the committee.

Office Bearers for 1998 are;

President: Kareen Mekertichian
Secretary: Joanna Seppelt
Treasurer: Heather Cameron
Committee:
Angus Cameron
Jean Horsburgh
Alain Middleton
Megan Phillips
Sarah Raphael
Richard Widmer.

The NSW Branch was very proud to help sponsor Mathew Fallan, a dentist from Papua New Guinea to attend the International Paediatric Congress in Buenos Aires in September. The standard of paediatric dental care in PNG is very poor and we hope to foster an interest in improving this situation. Richard Widmer and Eduardo Alcaino both made presentations at the congress.

Organisations are well underway for this years dinner meetings which will be held on Tuesday evenings 12th May, 11th August and 10th November. We look forward to a discussion of sugical options for children at our first meeting, when Debbie Cockrell, OMFS presents. To cut, freeze or burn.

Another exciting prospect for 1998 is the inclusion of an ANZSPD stand at the inaugural World Childrens Expo to be held at Homebush Bay from May 8th to 10th. This will be a great opportunity to promote the importance of Paediatric Dentistry to the community.

Victoria

The Victorian Branch celebrated the end of a wonderful year in 1997 at its annual End of Year Party. Our thanks to Jamie and Isobel Lucas for opening their home to the members and guests who attended. A great time was had by all! An exciting year lies ahead for the Victorian Branch. To celebrate 25 years of the Australian Society of Paediatric Dentistry, the Branch is coordinating the visit of Professor Edwina Kidd from Guy's Hospital in London. Professor Kidd will be the inaugural R K Hall Visiting Lecturer and she will be the keynote speaker at our two day convention on 10th & 11th September, 1998. She is highly regarded for her research into cariology and for her clinical expertise. She is a lively and entertaining speaker, and she will be supported by a number of local speakers.

"Mixed Dentition Treatment: Orthopaedics or Really Just Orthodontics? Ideal Intervention or Just a Rip Off?" is the topic of the lecture at our first dinner meeting for the year With Professor Michael Woods and Dr Derek O'Sullivan presenting opposite points of view, the evening will be most entertaining and stimulating.

This year has something for everyone. Professor Michael Aldred will be discussing oral developmental disorders in children at our April meeting. With the increase in erosive lesions in children and adolescents, Dr Anthony Dickinson's lecture on the prosthodontic management considerations of these lesions will be timely and well received at our June meeting. Our final meeting for the year in October will feature Dr Kareen Mekertichian, paediatric dentist, who will be discussing dental care of the medically compromised child.

In the chair this year will be our new President, Eda Franco. She will be ably supported by her Vice President, Felicity Wardlaw, who is a committee member of long-standing. Rhonda Kearley will continue as Treasurer, John Wilde as Federal Counsellor, Andrew Wood as an executive member and John Sheahan as Secretary. On behalf of the Committee I would like to take the opportunity to thank Jamie Robertson, who stood down after two years as Immediate Past President and Pam Dalgleish who stood down after two years as President at our Annual General Meeting. Both have worked tirelessly in their roles and all the members of the branch are grateful for their contribution.

Queensland

September 12th this year, the Queensland Branch held its Annual Clinic day. Our guest lecturer, Dr Linda Nelson DMD, MScD, was also the external examiner for the Queensland University Dental School. Dr Nelson is currently Clinical Instructor at the Harvard School of Dental Medicine, and is one of the faculty leaders in the new, problem-based curriculum at the Harvard School of Dental Medicine. Dr Nelson's major research interests centre on dental management of medically compromised children.

The programme was presented in a problem-based learning style which was extremely interesting to see in action. Dr Nelson spoke about many items of relevance to both Dentists and School Dental Therapists, in an ideas and thought provoking format which was very stimulating. Of particular interest to audience members was her discussion of latex allergies and medically compromised patients. Dr John Keys also gave us a presentation on his version of an easy space maintainence. He presented this same paper at the International Conference of the Paediatric Dentistry Society held in Buenos Aires later that same month.

The day was very well attended by both Dentists and Therapists and once again, the ChildrenÕs Oral Health Centre at Royal Brisbane Hospital provided an excellent venue. ANZSPD members generously gave of their time to show Dr Nelson our genuine hospitality with tours of the Gold Coast, hinterland, and private dinners hosted at their homes as well as the sights of Brisbane which Dr Nelson said were similar in appearance to Boston, with the river. Dr Kim Seow was instrumental in organising generous sponsorship for the day with donations from Colgate and GC.

Our final function for the year will be our AGM to be held, once again, at the United Service Club on the 8th December. Our guest speaker for the night will be Dr Glen Shiel who is the team leader for Queenslanders for Constitutional Monarchy. This promises to be a

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Obituary

Kevin Reginald Allen, BDS(Adel). Cert.Ped.(Illinois), FICD, FADI

Dr Kevin Allen on 8th November 1997. Those who knew him were aware that a man of vision, talent and compassion had passed away.

Kevin Allen was born at Bordertown on 16th April 1928. After graduating in 1952 he returned to practise in his home town of Bordertown. After several years in general practice he undertook postgraduate studies in Paediatric Dentistry in Chicago and returned to Adelaide to practise.

In addition to his practice, since 1966 Kevin was a member of the Faculty of Dentistry. For many years he was responsible for the teaching of Paediatric Dentistry in Adelaide. In that time he published numerous papers and spoke at national and international conferences. He was also involved with student exchange programmes to South East Asia.

Dr Allen's service to the profession was enormous. He served on numerous committees both at State and Federal level, and in recognition of his contribution to dentistry, was elected as an Honorary Life Member of the South Australian Branch of the Australian Dental Association.

He was a visiting consultant at the Women's and Children's Hospital and was involved in numerous community organisations in an honorary capacity. For the past two years, Kevin was Regent of the Academy of Dentistry International. Australasian Section and also served as the International Vice President of Education.

For many years he was responsible for the teaching of Paediatric Dentistry in Adelaide.

The biggest love of Kevin's life was his family but he also enjoyed music and sport. He was an accomplished musician and performed with several groups playing both the piano and saxophone. He was also a keen tennis player.

Kevin is survived by his wife Marion, his daughters and grandchildren.

Margaret Evans

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found to release the greatest amount of fluoride during the initial twenty-four hours upon placement. (Miller et al 1995) However the ability of GIC to release fluoride depends on the initial amount of fluoride in the GIC. (Hatibovic-Kofman et al 1997) The same study also showed that GIC can serve as a fluoride reservoir and hence act as a prolonged slow releasing system for at least 32 days. Generally, mechanically triturated GIC can release more fluoride than hand triturated ones. (Miller et al 1995)

GIC generally undergoes initial set in five minutes after mixing but maturation is not achieved until 24 hours. Dehydration can lead to spontaneous fracture while the presence of moisture can lead to stress relief. (Feilzer et al 1995) However excessive moisture can leads to weakening of the restoration and hence a layer of unfilled resin should be applied for protection. (Kilpatrick 1996) Application of vaseline or varnish, on another hand, cannot aid in the protection of the restoration from moisture, but may even penetrate into the cavity margins and compromise the bonding of GIC to tooth structure. (Hoffa et al 1993)

Developments of GIC

In the restoration of primary teeth, GIC has been suggested to be successful in small Class I situations. (Attwood et al 1994; Fuks et al 1984) However, usage in Class II cases are more controversial. Actually, the use and success of GIC as a restorative material in children and adolescents differs amongst the types of GIC used. With the development of GIC, resin materials have been included into the GIC matrix. The contents of the material can therefore be used to define the different types of GICs:

- **Metal reinforced**
  - * Ketac silver
- **Pure GIC**
  - Ketac fil
  - Fuji I
  - Chem fil
- **RMGIC**
  - Photac fil
  - Fuji II LC
  - Vitremer Tri Cure
- **Compomers**
  - Dyract
  - Compoglass
- **Pure Composite Resins**
  - Herculite
  - Z 100
  - Occlusin

Conventional GIC

Conventional GIC (Fuji II , Ketac fil etc) were the original type of GIC. They have an advantage of being more adhesive and hence can prevent microleakage better. (Fuks et al 1984) In this study, the surface and colour, anatomic form and marginal integrity of Fuji II were investigated. Only nine out of 101 Class II restorations in primary molars met all the requirements in one year. A three-year study (Attwood et al 1994) was also carried out with results supporting the previous study by Fuks et al in 1984. Both studies concluded that GIC is not a material of choice in restoring Class II cavities in primary teeth. Failure rate in three years , however , was found to be 57.3% , which is lower than that in the one year study by Fuks. In the study by Attwood, the most common cause of failure in conventional GIC was found to be the total loss of restorations.

Glass Ionomer Silver Cermets

To deal with the problems of low wear resistance and being radiolucent, Glass ionomer silver cermets were introduced in 1985. (Croll & Phillips 1986) It combined conventional GIC with pure silver particles. The resultant material was claimed to be more durable. (Moore et al 1985) Twelve different uses of GI silver cermets were also suggested: (Croll & Phillips 1991)

- Class I in primary and permanent teeth;
- Class II in primary teeth;
- Temporary Class I in permanent teeth;
- Class III in primary canine;
- Class V in primary and permanent teeth;
- For repairs of stainless steel crowns;
- As a base under amalgam or composite restorations;
- Tunnel preparation in primary and permanent teeth;
- Repair of crown margins;
- Restoration in primary teeth after pulpotomy for more than three years;
- Direct restoration of mesial aspect of permanent first molars;
- As a core in crowns.

In the early studies, two disadvantages of GI

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silver cermets were addressed. First was the production of gray staining at the margin of the restoration, due to the production of silver oxide. The second problem was its low tensile strength and fracture toughness. These may lead to fracture of Class II restorations. (Croll & Phillips 1986) The first disadvantage was eliminated later by the addition of titanium dioxide. (Croll & Phillips 1991) The second disadvantage, however, remains a major problem in the use of GI silver cermets in the restoration of primary teeth. Also wear resistance of GI silver cermets was only superior to conventional GIC within the first eight hours of placement, after that, wear resistance values become similar. (Gee et al 1996) Failure rate of Ketac silver was found to be 41% when comparing to Ketac fil which has a failure rate of 23%. (Kilpatrick et al 1995) As a result, it has been concluded that GI silver cermets is not a suitable material in restoring primary teeth. (Kilpatrick et al 1995; Kilpatrick 1996) This findings were contrasting to the earlier suggestion that GI silver cermet restorations can last at least six years in human mouths. (Croll & Phillips 1991)

Resin-Modified GIC

The more recent development is the invention of Resin-Modified GIC (RMGIC) in the late 1980s. With the advancement in research and development, RMGIC can be further divided into three different groups: Dual- cure; Tri- cure and Compomers. (Kilpatrick 1996)

Dual-Cure RMGIC

Dual- cure materials contain 80% GIC contents combining with 20% of light-cured resin materials. (Croll et al 1993) These materials are claimed to have all the advantages of conventional GIC. In addition, they can be cured in 30-60 seconds by the use of visible light. After that, the GIC setting reaction continues. (Croll et al 1993). As a result, treatment time can be reduced by 5-7 minutes per restoration. (Croll & Killian 1992) RMGIC were claimed to be suitable in restoring Class II lesions in primary teeth. (Croll & Killian 1993) Also they can be used in restoring microcavities in permanent teeth with proximal caries. (Sidhu & Watsons 1996) The best representation of this use is the tunnel preparations. The advantages of this preparation being that the marginal ridge can be conserved, also the radiopacity and fluoride releasing property of RMGIC help to prevent secondary caries and serve to protect the contact area of the adjacent teeth. (Kilpatrick 1996)

When dual- cure RMGIC is used, it is important to make sure that the material is cured adequately. (Swift et al 1995) Therefore an incremental placement and curing of 2 to 3 mm is recommended for these materials.

Tri-Cure RMGIC

In tri-cure materials, besides the light-curing and acid-base GIC reactions, a redox "dark-cure" reaction also exists. This enables a better setting reaction in the deep parts of the restorations to compensate for the insufficiency of the light-curing process. (Croll & Helpin 1995) In the same study, it was shown that Class II restorations with Vitremer in primary molars are durable and reliable for at least one to one and a half years.

Its advantages also involve an improved radiopacity. (Kilpatrick 1996) Besides, tri-cure materials do not require incremental curing in large restorations. This is because the tri-cure mechanism will ensure an adequate cure of the material, also it suffers less polymerisation shrinkage than conventional composite resins. (Croll & Killian 1993) Also, unlike conventional GIC, the cured material is not susceptible to over-dehydration or desiccation. (Croll & Killian 1993)

When dual- cure RMGIC is used, it is important to make sure that the material is cured adequately. It has been shown that only the top 5 mm of a 9 mm RMGIC specimen is consistently hard enough ten minutes after visible light activation.

Compomers

On another hand, compomers contain 70% of resin content and is claimed to have a decreased sensitivity to moisture, better aesthetics and improved strength. (Vaikuntam 1997) These materials actually absorbs 3% by weight of moisture to allow an acid-base reaction to begin. (Kilpatrick 1996) Besides the conventional restorations, compomers can also be used to veneer stainless steel crowns when aesthetics is required. (Salama et al 1997) Shear bond strength of compomer to stainless steel is best improved by attaching a previously spot-welded lingual cleats to the stainless steel crown. (Salama et al 1997)

Arguments have been raised to whether compomers should be classified as RMGIC. To be classified as GIC, the material should be able to set in the dark due to the acid-base reaction. (Mclean et al 1994) Therefore with 70% of resin content, compomers should be correctly classified as polyacid-modified composites resins instead of RMGIC.

Base and Liner GIC

Besides the restorative GIC materials, base and liners (eg. Vitrebond) has also been used as dentine and enamel restorative material in pediatric dentistry. (Croll & Killian 1992) This is especially applicable in cases where the patient is very young and conventional restorations cannot be carried out properly. For instance in early nursing bottle caries. Vitrebond has been suggested to use as an interim restorative material in these cases. (Croll 1991) The theory behind this is that smooth surface restorations in primary teeth are not subject to high level of stress. Also due to the ease of placement of the base materials make it a viable alternative. (Kopel 1991)

When a material is used for temporisation purposes, no matter it is a base material or a compomer, it is important that the material can form adequate bonds to carious dentine. This is because often only gross removal of caries is performed in the tempoisation process. It has been found that pretreatment with polyacrylic acid can lead to an increased in shear bond strength of GIC to both carious and non-carious dentine. This is especially the case when light-cured GIC is used. (Way et al 1996)

Comparing GIC with Other Materials

After an overview into the use of different types of GIC in pediatric dentistry, it is important to compare the success rate of GIC with the other restorative materials. Amalgam and composites have long been popular in the field of restorative dentistry. Stainless steel crowns , on the other hand, is a popular form of restorations in pediatric dentistry, especially when there has been a significant loss of tooth structure or after pulpotomy of the tooth. The advantages of stainless steel crowns mainly lie on its durability , with survival rate of 68% over five years, as compared to 5% in four years for GIC. (Papathanasion et al 1994) However they are more destructive of tooth structure, not aesthetic and are also time consuming. (Kilpatrick 1996)

On another hand, GIC do have their roles in the restoration of teeth in children and adolescents. They are shown to provide high protection against recurrent caries. (Sepet et al 1995) Also when compared to an amalgam cavity, GIC cavities are more conservative in tooth structures. (Forsten & Karjalainen 1989) A GIC restoration was found to occupy an average of 16% of the occlusal surface of a primary molar comparing to 28% of a similar amalgam restoration. (Welbury et al

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1991) GIC is also more biologically compatible than amalgam and composites. The technique in using GIC is much simpler than that of composite resins. (Forsten & Karjalainen 1989)
A clinical research associates survey showed that amalgam is still the most widely used restorative material in primary molars, comprising 73% of all the cases. (Christensen 1996) It has the advantages of being easy to use; technique insensitive; economic and has good mechanical properties. However, when compared to GIC, it is not adhesive; less aesthetics; may corrode and also raises the issue of mercury toxicity. (Kilpatrick 1996) Also, due to the higher occlusal abrasion of primary teeth, some loss of anatomical form in the amalgam restorations may results. (Hickel & Voss 1990)
Multiple studies have been carried out to compare success rate of GIC with other materials in pediatric restorative dentistry and their results varied.

Amalgam

When GIC is compared to amalgam, anatomical forms and marginal integrity seem to be the two crucial factors of consideration. A two year study (Walls et al 1988) demonstrated that GIC suffered more loss of anatomical form than amalgam, while similar results were yielded for marginal integrity. A conclusion was therefore drawn that GIC is as good as amalgam in two years of service. However in another study (Welbury et al 1991) both marginal integrity and anatomical form were found to be worse in GIC. Hickei & Voss 1990 compared Ketac silver with amalgam and found that Ketac silver has a better marginal integrity but a worse anatomical form than amalgam.

Survival Rate

In terms of survival rate, Hickel & Voss 1990 found the average survival time for Ketac silver to be 2.5 year, while for amalgam is 2.6 years which is very similar. Welbury 1991 demonstrated that the median survival time for conventional GIC is 33.4 months while for amalgam, it is 41.4 months. Osltund et al 1992 found that the failure rate after three years for amalgam to be 8%; composite 16% and GIC 60%. Failure of GIC restorations in Class II cases were found to be most common at the isthmus region, hence a careful cavity design would be desired to solve this problem. (Ostlund et al 1992) Five- year survival rate was also studied (Papathanasion et al 1994), it was found to be 60% for amalgam; 5% only for GIC. The median survival time for amalgam was found to be 32 months and 12 months for GIC. A huge difference can be seen in the median survival time of GIC between the Papathanasion et al 1994 and the Welbury et al 1991 studies.

Composite Resins

Composite Resins, on another hand, is the most aesthetic restorative material. However, it is technique sensitive and requires good isolation. Also it is subjected to polymerisation shrinkage, which may compromise the adhesion to the cavity walls. Margins of the cavities should also be bevelled to enhance bond strength, resulting in less enamel fracture and improved retention. (Jumlongras & white 1997) Composite resins are also relatively expensive and they are not adhesive to dentine. (Kilpatrick 1996) In terms of strength, it is however stronger and has a higher wear resistance than GIC. (Kilpatrick 1996)

Not surprisingly, all GIC are subjected to high wear when direct occlusal contacts were encountered. Therefore, GIC is not a material of choice in high stress-bearing areas.

Shear Bond Strength

When composite resin (Herculite) is compared with Compomers (Dyract and Compoglass), in restoring primary and permanent teeth, none of the materials was able to reach a adequate shear bond strength of 17.6MPa in primary teeth. However, the compomers can provides similar bond strength in both primary and permanent teeth, while Herculite provides a much lower bond strength in primary teeth than in permanent teeth. (Jumlongras & White 1997) One of the reasons is due to the difficulty of bevelling the cavosurface margins of anterior primary teeth. This is because of the large pulp chamber, thin enamel and reduced tooth structures in primary teeth. Therefore in Class IV situation in primary teeth, compomers may be recommended instead of composite resins.

Tensile Strength

However when dentine tensile strength is compared between composites and GIC, hybrid composites (Tetric) was shown to be superior with a value of 5.17Mpa. While RMGIC (Photac fil) only has a value of 0.42MPa, Dyract 2.35MPa and Compoglass 1.82MPa. (Kielbassa et al 1997) Similar to the bonding to enamel, the bonding of materials to dentine of primary teeth is also compromised due to the difference in structure in primary teeth. In primary teeth, there is less intertubular dentine, which affects the formation of a hybrid layer. This leads to a reduction in bond strength of hybrid composite resins. The adhesion of RMGIC is affected due to the increased thickness of peritubular dentine as a result of caries. This leads to a reduction in the penetration of dentine conditioner. At the same time, a reduction in the degree of mineralisation of primary teeth leads to reduced ionic and polar forces between dentine and GIC, hence compromising its adhesion. (Kielbassa et al 1997)

Fracture Toughness

In terms of fracture toughness, RMGIC was shown to be significantly tougher than composites (Herculite). (Kovacik & Muncy 1995) Fuji II LC has a fracture toughness of 1.37 $MPa.mm^{0.5}$ and Photac fil 1.27$MPa.mm^{0.5}$. Herculite has a fracture toughness of 1.17 $MPa.mm^{0.5}$. This suggests that RMGIC may have an advantage in stress bearing areas such as in the cases of core build-up. While Ketac silver only has a value of 0.51$MPa.mm^{0.5}$, it is even weaker than the base materials eg. Vitrebond. This finding therefore supports the suggestion that GI silver cermets are not suitable in the restoration of primary teeth. (Kilpatrick et al 1995; Kilpatrick 1996)

Survival Rate

However when survival rate of GIC is compared to composite resins, composites are shown to be superior. A study shows that failure rate of composites after three years was 16%, while for GIC 60%. (Ostlund et al 1992) A retrospective study ranked the materials in order of highest to lowest survival rate in primary teeth: Stainless steel crowns, amalgam, composite resins, GIC. The median survival time of composites was found to be 32 months with a four- year survival rate of 40%. For GIC, median survival time was found to be only 12 months, with a 5% of four year survival rate. (Papathanasion et al 1994) This coincides with a long term study which shows that 62% of composites failed in six years. (Varpio 1985)

Wear Resistence

One of the most addressed disadvantages of GIC is its low wear resistance. A study was carried out to assess the wear of different types of GICs in contact free areas over one year, followed by an acid susceptibility test, then finally an occlusion simulation test. (Gee et al 1996) The results indicated that RMGIC is the most susceptible to wear. However, all materials demonstrated improved wear resistance with time, probably due to the slow-progressing acid-base reaction. Conventional GIC and GI silver cermets are found to be more susceptible to acid wear at pH5 environment. Not surprisingly, all GIC are subjected to

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high wear when direct occlusal contacts were encountered. Therefore, GIC is not a material of choice in high-stress-bearing areas. (Gee et al 1996) This result agreed with most other studies. (Kilpatrick 1993; Hickel & Voss 1990; Forsten & Karjalainen 1990)
Amalgam and composites , on another hand, demonstrated much lower wear, and therefore are more suitable in restoring high-stress-bearing areas.

Conclusions

In the above discussion, an overview of the properties of GIC; the different types of available GIC; its success rate with compared with other restorative materials in the field of pediatric dentistry have been provided. With the advantages of adhesion to enamel and dentine, biocompatibility and fluoride release, there is no doubt that the invention of GIC has provided a very viable alternative in pediatric restorative dentistry. However some problems still remain as to its inadequate strength in stress bearing areas; sensitivity to moisture and dehydration; handling characteristics , just to name a few. Further research is certainly required for the advancement of the development of an even better breed of GIC that is not only suitable in restoring primary teeth, but also in permanent teeth as well.

References

Andersson-Wenckert IE et al . Effect of cavity form on the durability of glass ionomer cement restorations in primary teeth: a three-year clinical evaluation J Dent children 1995 May-June : 197-200

Attwood D et al. Assessment of glass polyalkenoate restorations in primary molar teeth. Eur. J Prosthodont Rest Dent 1994 -(4): 183-5

Christensen GJ. Why is glass ionomer cement so popular? JADA 1994 September 125(9):1257-8

Christensen GJ. Restoration of pediatric posterior teeth. JADA 1996 127:106-8

Croll TP & Helpin ML. Class II vitremer restoration of primary molars. J Dent Children 1995 January-February : 17-21

Croll TP & Killian CM. Glass ionomer resin restoration of primary molars with adjacent class II carious lesions. Quintessence International 1993 24(10): 723-7

Croll TP & Killian CM. Restoration of class II carious lesions in primary molars using light-hardening glass-ionomer-resin cement. Quintessence International 1993 24(8): 561-5

Croll TP & Killian CM. Visible light-hardened glass-ionomer-resin cement restorations for primary teeth: new developments. Quintessence International 1992 23(10):679-82

Croll TP & Phillips RW. Glass ionomer silver cermet restorations for primary teeth. Quintessence International 1986 17(10):607-15

Croll TP & Phillips RW. Six years' experience with glass ionomer silver cermet cement. Quintessence International 1991 22(10):783-93

Croll TP et al . A restorative dentistry renaissance for children: light-hardened glass ionomer/resin cement. J Dent Children 1993 March-April : 89-94

Curzon MEJ et al. Restoration of primary molars (letter). Br Dent J 1996 180(7):246

Feilzer AJ et al. The influence of water sorption on the development of setting shrinkage stress in traditional and resin-modified glass ionomer cements. Dent Mater 1995 May 11:186-90

Forsten L & Karjalainen S. Glass ionomer in proximal cavities of primary molars. Scand J Dent Res 1990 98:70-3

Fuks AB et al. Clinical evaluation of a glass-ionomer cement used as a class II restorative material in primary molars. J Pedodontics 1984 8:393-9

Gee AJ et al. Early and long-term wear of conventional and resin-modified glass ionomers. J Dent Res 1996 75(8): 1613-1619

Hatibovic-Kofman S et al. Glass ionomer materials as a rechargable fluoride-release system. Int J Pediatric Dent 1997 7:65-73

Hickel R & Voss A . A comparison of glass cermet cement and amalgam restorations in primary molars. J Dent Children 1990 May-June: 184-8

Hoffa M et al. The effect of glaze on restorative glass ionomer cements: evaluation of environmental durability in lactic acid solution. J oral Rehab 1993 22:685-9

Jumlongras D & White G. Bond strengths of composite resin and compomers in primary and permanent teeth. J clin Pediatric Dent 1997 21(3);223

Kielbassa AM et al . Initial tensile bond strength of resin-modified glass ionomers and polyacid-modified resins on perfused primary dentin. J Dent Children 1997 May-June: 183-7

Kilpatrick NM et al . A clinical comparison of a light cured glass ionomer sealant restoration with a composite sealant restoration. J Dent 1996 24:399-405

Kilpatrick NM et al. The use of a reinforced glass-ionomer cermet for the restoration of primary molars: a clinical trial. Br Dent J 1995 179:175-179

Kilpatrick NM. Durability of restorations in primary molars. J Dent 1993 21:67-73

Kilpatrick NM. Glass ionomer cement: their application in children, part 1. Dental Update 1996 July/Augest: 236-8

Kilpatrick NM. Glass ionomer cement: their application in children, part 2. Dental Update 1996 September: 288-93

Kopel HM. Use of glass ionomer cements in pediatric dentistry. CDAJ 1991 September 19(9):35-40

Kovarik RE & Muncy MV. Fracture toughness of resin-modified glass ionomers. Am J Dent 1995 May 8(3):186-90

McLean JW et al . Proposed nomenclature for glass-ionomer dental cements and related materials. Quintessence International 1994 25(9):587-9

Miller BH et al. Effect of glass ionomer manipulation on early fluoride release. Am J Dent 1995 8(4): 182

Mount C. Making the most of glass ionomer cements:1. Dental Update 1991 September : 276

Ostlund J et al . Amalgam, composite resin and glass ionomer cement in class II restorations in primary molars Ñ a three year clinical evaluation. Swed Dent J 1992 16:81-6

Papathanasion AG et al . The influence of restorative material on the survival rate of restorations in primary molars. Pediatric Dent 1994 July/August 16(4): 282-8

Salama FS et al. An in vitro comparison of four surface preparation techniques for veneering a compomer to stainless steel. Pediatric Dent 1997 19(4): 267

Sepet E et al . Artificially formed caries-like lesions around class II glass ionomer restorations in primary molars. J Clin Pediatr Dent 1995 20:37-40

Sidhu SK & Watson TF. Resin-modified glass-ionomer materials part2: clinical aspects. Dental Update 1996 January/February: 12

Swift EJ et al. Depth of cure of resin-modified glass ionomers. Dent Mater 1995 May 11:196-200

Vaikuntam J. Resin-modified glass ionomer cements (RM GICs): implications for use in pediatric dentistry. J Dent children 1997 March-April: 131-4

Varpio M . Proximoclusal composite restorations in primary molars: a six-year follow up . J Dent Child 1985 52:435-440

Walls AWG et al. The use of glass polyalkenoate (ionmer) cements in the deciduous dentition. Br Dent J 1988 165:13-7

Way JL et al. Bond strength of light-cured glass ionomers to carious primary dentin. J Dent Children. 1996 July-August: 261-4

Welbury RR et al . The 5-year results of a clinical trial comparing a glass polyalkenoate (ionomer) cement restoration with an amalgam restoration. Br Dent J 1991 170:177-81

Wilson A & Kent BE. A new translucent cement for dentistryÑthe glass ionomer cement. Br Dent J 1972 132:133-5

Oral Habits in Children: Aetiology & Management

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Oral habits may be defined as non-functional repetitive activity which can produce deleterious effects on the dental, periodontal and neuromuscular structures. In children, the presence of an oral habit is of particular concern if it persists following the eruption of the permanent teeth. Studies have shown that the presence of an oral habit is a disturbingly common finding among children. In a cross-sectional epidemiological study of 749 children and adolescents of ages 7-18 years, Nilner (1985) noted oral habits in 75% of the study population1. Statistically significant correlations were found between the habits reported and the prevalence of recurrent headaches and tenderness to palpation of the TMJ muscles in the individuals examined. Most recently, Bayardo et. al. (1996) analysed 1,600 case histories of children aged between 2-15 years seen over a 15-year period[2]. The presence of some type of oral habit was reported in 56.8% of the cases analysed.

This paper will focus on the following oral habits seen in children: (a) thumb and fingersucking; (b) pacifier habits; (c) tongue habits; (d) lip habits; (e) nail biting; (f) mouthbreathing; and (g) bruxism. A discussion of the proposed aetiology of these habits and their effects on the stomatognathic system is also included, with possible techniques in management.

Aetiology of Oral Habits

Oral habits were initially believed to be manifestations of serious unconscious emotional disturbances. It was also believed that intervening to stop these habits would only compound the problem and produce more unusual psychopathic manifestations. Psychoanalysts suggested that these problems be treated primarily by addressing the underlying psychopathology. This view, however, is no longer widely accepted. Although emotional factors may be involved in the aetiology of some oral habits, there is no evidence that the emotional disorder will intensify by treating the self-destructive oral habit[3].

From a behavioural aspect, the aetiology of oral habits may be best understood in terms of social-learning principles[4]. Most human behaviour patterns are acquired through learning. Except for a few reflexive functions, most human oral behaviours are governed by their consequences. For example, thumbsucking may be reinforced by the attention it brings from the parent. Although attention may be in the form of a reprimand, many children find any attention preferable to none at all.

A social-learning model accounts for both biological and psychological factors which typically interact in subtle and complex ways in producing certain patterns of social behaviour. A number of psychophysiological factors have been implicated as possible contributors to oral habits in children. These include: conflicts in the home, school pressures, increased social stresses, emotional instability, occlusal interferences, malocclusion, irritation associated with tooth eruption, and breathing obstructions.

Successful management of self-destructive oral habits invariably involves a recognition of the multifactorial aetiology of these habits by the dental practitioner. Family, social, environmental and biological factors can all have a significant influence on the behaviour pattern of the child. As a result, long-term changes in behaviour can only be achieved by addressing both physiological and psychological aspects of the oral habit.

Thumb and Finger Sucking

Fingersucking, particularly thumbsucking, is one of the most commonly seen oral habits in children. Studies by Traisman and Traisman involving 2650 infants and children observed from birth to 16 years of age revealed that 45.6% of the study population sucked their thumbs at some time during the observation period[5]. It was also noted that 75% of these children began during the first 3 months of life while 25% began during the remainder of the first year. The average age at which the habit ceased was 3.8 years although some stopped as late as 15 years of age[5].

Digit sucking is believed to be a natural act in the newborn, which may begin in some cases in utero. Fingersucking in the neonate is believed to be initiated by the normal continuation of the rooting and placing reflex, which enables the infant to obtain milk from the mother's breast[6]. Sucking in infancy is important in meeting both nutritional and psychological needs. During feeding, in addition to nutritional satisfaction, the infant also experiences pleasurable stimuli from the lips, tongue and mucosa and learns to associate these with other enjoyable sensations (eg. fondling, closeness, the voice of the parent). Thus, both nutritive sucking for food and non-nutritive sucking for psychological satisfaction are considered normal in infancy.

Prolonged digit-sucking habits into childhood, however, can contribute to malocclusion. As a general rule, sucking habits during the primary dentition have little if any long-term effect. Massler and Wood postulated that when the tongue and lip function is normal, malocclusion of the deciduous dentition caused by thumbsucking usually corrects itself after the habit ceases, while malocclusions of mixed or permanent teeth are usually not self-corrective[7]. If these habits persist beyond the time that the permanent teeth begin to erupt, malocclusion is characterised by flared and spaced maxillary incisors, lingually positioned lower incisors, anterior openbite and maxillary constriction may result with anterior displacement of the maxilla8. The characteristic malocclusion associated with sucking is produced by a combination of direct pressure on the teeth and an alteration in the pattern of resting cheek and lip pressures. The type of changes seen to the dentition may vary according to the intensity, duration and frequency of the habit. Studies have shown that approximately 4-6 hours of force per day is necessary to produce orthodontic tooth movement. Thus, the degree to which the teeth are displaced should correlate better with the number of hours per day of sucking than with the magnitude of the pressure[25]. As a result, children who suck with high intensity but intermittently may not necessarily show significant occlusal discrepancies, whereas those who produce 6 hours or more of pressure, particularly those who sleep with a thumb or finger in the mouth at night, can produce a significant malocclusion.

Both psychoanalytical and behavioural theories have been used to explain the psychologic aetiology of digit-sucking. According to the psychoanalytical theory proposed by Freud,

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these habits were neurotic symptoms associated with an emotional disturbance resulting in an arrest in the evolution of the oral psychosexual phase of development. The psychoanalytical theory proposes that the prolongation of fingersucking results from a disturbed emotional or social environment. As discussed previously, the psychoanalytical theory also suggests that a sudden elimination of the habit would be detrimental to the child's emotional development. In contrast, the learning theory explains fingersucking as a learned behaviour, and aggressive treatment of the habit would not place the child at risk of any deleterious emotional consequences. Current techniques in the management of thumb and fingersucking recognise components of both theories, accepting that a number of factors may contribute to the aetiology of the habit.

umerous techniques have been proposed in the management of digitsucking. These include: hypnosis, punishment, fixed or movable appliances, arm splints, bitter tastes, visual education, Gestalt therapy, increased parental devotion, love and understanding, gloving, habit reminders, elbow bandaging, verbal discussions, etc[9]. For any treatment to be successful in controlling a digit habit in the long-term, the child must show a genuine interest in stopping the habit. Thus, case selection is critical for the success of a particular technique.

Prior to choosing the appropriate treatment protocol, a thorough and careful history of the patient is necessary to try to determine the underlying cause. The dental practitioner should try to ascertain if the habit is one which the child enjoys or if there are underlying emotional problems. The duration, intensity and frequency of the habit may also be discerned by questioning the parent. In general, pleasurable sucking is intermittent and not forceful. If the habit has a deeper emotional aetiology, it may be more continuous and more forceful, thus having a greater effect on the dentition[10]. Associated symptoms such as bedwetting and a fear of the dark may alert the dentist to an emotional component to the aetiology of the habit.

In cases where the child is emotionally not ready to accept any modifications in behaviour (eg. during periods of family unrest, divorce proceedings, if the child is failing in school), treatment to stop the habit may be unsuccessful. The dentist, in this case should be reluctant to interfere and may be best advised to refer the family to medical or psychological experts.

Examination of the digits for callus formation, a cleaner fingernail or a reddish colour can enable the identification of the digit(s) involved and the pattern of fingersucking. The extent of any malocclusion caused by the habit may also be determined by means of an intra-oral examination. In cases where the occlusion is severely disturbed, cephalometric records can aid in determining the growth characteristics of the child. In cases with an unfavourable growth pattern, the fingersucking may aggravate, but may not necessarily be the primary cause of the malocclusion.

Timing of treatment is critical in the management of digitsucking. Prior to six years of age, the child should be given an opportunity to stop the habit spontaneously before the eruption of the permanent incisors. At 4-6 years of age, if the child shows an interest in stopping the habit, a permissive approach to treatment is used with the aid of simple "reminder" techniques. This may be in the form of an adhesive bandage taped to the finger, providing a constant reminder not to place the finger in the mouth. Bitter-tasting solutions placed on the finger also remind the child to refrain from sucking, but this technique is seen as punishment and may not be as effective as neutral reminders. If the child is unwilling to stop the sucking habit, thumb guards, mittens and intra-oral appliances all usually fail.

If the habit persists following eruption of the permanent incisors and the child genuinely wishes to stop the habit, corrective appliance therapy may be necessary. A variety of intra-oral fixed or removable appliances are available which interfere with the ability to suck the digits and receive pleasure from it. It is important that these appliances are not viewed as punitive devices by the child and are to be used only with the child's permission. A palatal crib designed as a series of small loops placed lingual to the incisors may be used to interrupt a fingersucking habit by interfering with finger placement and sucking satisfaction. While the child and parents are warned of initial difficulties with speech, mastication and sleep patterns with the appliance in place, the child usually adjusts within two weeks[11]. The choice of a fixed or removable appliance may be made on the clinical judgement of the dentist. A removable appliance may be of greater use, for example, in a child who wants to stop the habit but might be engaged in a meaningful sucking activity (eg. due to family problems). In this case, the removable appliance is better accepted by the patient since the child can easily remove it if his/her emotional status demands it.

Most recently, a non-punitive fixed appliance using a Teflon roller has been reported to produce favourable results in the management of fingersucking[12]. The "Bluegrass" appliance is cemented to the upper molar teeth, with the Teflon roller placed on the most superior aspect of the palate without actually contacting the palatal tissues. The device works through a counter-conditioning response to the original conditioned stimulus for thumbsucking, with instructions given to "turn the roller with the tongue" instead of sucking the digit. Minimal disturbances to speech and mastication have been reported compared with other appliances, with high success rates in managing the habit.

Corrective appliances are usually left in the mouth for at least 6 months. The child may be encouraged to keep a record of his/her progress, with positive behaviour reinforced by both the dentist and the parents. Regular check visits are advised during this period to assess how the child is adjusting to the treatment and to ensure that the appliance is not disturbed. These visits are also useful in showing that child how the position of his/her teeth are improving. If the malocclusion is severe, corrective appliance therapy may need to be followed by orthodontic treatment for realignment of the occlusion.

As with other oral habits, the role of the parent is critical in the management of a thumb or fingersucking habit. The parent must be educated on the possible dental effects of the habit and the techniques in management. If punishment or bribery are used in the home in an effort to discourage the habit, these should be stopped since they may actually serve to reinforce the activity. In some cases, changes to the home environment may be necessary before the child can overcome the habit, particularly if there is an emotional component to the aetiology of the habit. The parent is required to be supportive of the child during treatment, with positive behaviour reinforced.

Pacifier Habits

Pacifiers are used in children to satisfy their instinctive sucking urges. Swedish studies have shown a decline in the prevalence of fingersucking habits in the last decade, related to a concurrent increase in the use of pacifiers in children[13,14]. While a pacifier habit is generally considered better than a fingersucking habit, the dental effects caused by both activities are similar, with bucco-lingual movement of the incisors, anterior openbite and maxillary constriction. More recent designs of pacifiers, however, claim to be more physiologically acceptable and thus reduce the risk of malocclusion. Manufacturers claim that these newly designed pacifiers conform to the baby's lips, with the smooth and adapted contour promoting nasal breathing. The design of a flat nipple also simulates the shape of the mother's breast, allowing the tongue to touch the palate in a more natural sucking position and improving the lip seal[15].

In general, pacifier habits are considered to be managed more easily than fingersucking habits. The use of a pacifier tends to be less chronic than fingersucking, and the habit may be discontinued gradually over time under the control of the parent. It must be noted, however, that abrupt weaning is not advised since the child may substitute the pacifier habit with another oral habit (eg. fingersucking) in order to receive oral gratification[16].

Tongue Habits

Tongue thrusting during swallowing and abnormal tongue posture form the majority of tongue habits seen in children. Tongue thrusting, defined as the placement of the tongue tip forward between the incisors during swallowing, is characteristic of the infantile and transitional swallowing patterns and is considered normal in the infant. Gellin noted that about 97% of newborns will tongue thrust. This figure declines to 80% by 5-6 years of age[17]. Maturation of the swallowing reflex to an adult pattern where the tip of the tongue is placed against the alveolar bone behind the maxillary incisors is not present in the majority of children until about age 6. However, this pattern may never be achieved in about 10-15% of a typical population[18].

In general, tongue thrusting may be seen in two main circumstances: (a) in younger children as a transitional stage in the normal physiologic maturation to an adult swallowing pattern, and

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(b) at any age in patients with displaced incisors, resulting from an adaptation of the tongue to the space between the teeth[19].

Where there have been no changes in occlusion, treatment to modify the habit is not warranted, although the unaesthetic social aspects of the habit may necessitate management. In cases with an associated increase in overjet and anterior open-bite, however, tongue thrusting may act to maintain the malocclusion. Correction of the malocclusion has been shown to result in a change in swallowing pattern to adapt to the new arch form[20]. The use of simple habit-breaking appliances have been recommended in cases where the tongue thrust may be associated with a digit habit and persists once the fingersucking has ceased. A mandibular lingual arch with a crib or a palatal retainer may be used as reminders to position the tongue properly during swallowing[21]. Tongue thrusting may also be associated with chronic airway problems such as pharyngitis, tonsillitis and nasorespiratory distress[22]. This is best managed in association with a pediatrician.

While it is not clearly understood whether tongue thrusting is an aetiological factor in the development of a malocclusion, abnormal tongue posture at rest is considered to produce a greater effect on the dentition. Two forms of tongue posture are recognised: (a) the endogenous protracted tongue posture where the tongue is placed between the incisors at rest; and (b) the acquired protracted tongue posture, which usually results from nasorespiratory problems. Correction of the acquired tongue posture is generally considered to have a better prognosis once the precipitating causes have been corrected. In some cases, the lingual fraenum may restrict tongue movement and can be the cause of the abnormal tongue posture. In this situation, a surgical procedure to release the fraenum may correct the problem[23]. The endogenous posture, however, may result in problems that are more difficult to manage.

The role of myofunctional therapy as an adjunct in the treatment of tongue habits has been proposed by several authors. While circum-oral myofunctional exercises have not shown to produce any significant dental changes, the use of this technique to correct particularly abnormal tongue posture may aid in preventing relapse following orthodontic treatment[21,23,24]. The child may also accept this form of therapy more readily than intra-oral corrective appliances.

Lip Habits

A variety of lip habits exist in children, ranging from lip licking to lip sucking and biting. While most lip habits do not produce dental problems, habits such as lip sucking and biting can contribute to maintaining an existing malocclusion[25]. Lip sucking may be recognised by a reddened, irritated and chapped area below the vermilion border. In some cases, the vermilion border may actually be relocated further outside the mouth due to the constant wetting of the lips[26]. Although the habit may occur with both lips, it is more commonly associated with the lower lip.

A variant of the lip sucking habit is the mentalis habit. Originating on the labial surface of the mandible in the area of the apices of the mandibular incisors, the mentalis muscle acts to lift the lower lip. When this muscle is flexed, the skin of the chin appears puckered. In the mentalis habit, the vermilion border of the lower lip is often everted, with the lingual aspect elevated into the mouth. A sublabial contracture line may also be evident between the lip and chin. In contrast, lip sucking results in the entire lip including the vermilion border being pulled into the mouth.

Both habits result in a wedging of the lip between the upper and lower incisors. Repetitive activity with sufficient intensity may result in movement of the maxillary incisors labially with interdental spacing and collapse of the lower incisors lingually producing crowding. In a Class II Div 1 malocclusion, the existing overjet may be increased.

Management of a lip sucking habit may involve treatment of the underlying malocclusion. In cases with excess overjet, the lip may actually become trapped behind the upper anterior teeth. Resolution of the overjet can reduce the frequency of the habit. If the habit persists, management may involve the use of a habit-breaking appliance such as a lip bumper or a modified oral shield[27]. These appliances make the practice of drawing the lower lip between the anterior teeth more difficult and thus serve as a reminder to the child not to perform the habit. The soft-tissue damage caused by the habit may be treated palliatively using lip balms and ointments.

Nail Biting

Onychophagia is another oral habit commonly found in children. Several studies have reported the prevalence of nailbiting in children and adolescents occurring in about 50% of the population[1,28]. The habit generally starts at 4-5 years of age. Among 7-10 year olds, the incidence remains relatively constant but again rises during puberty. During the late teenage years, the incidence of nailbiting begins to fall and continues to decline into adulthood. Despite this, many adults continue with the habit throughout life[29].

The effect of nailbiting, particularly intense nailbiting, on the stomatognathic system are largely due to a repetitive loading of the temporomandibular joints in an eccentric position which may be practised over several years. It can also contribute to hyperactivity of the lateral pterygoid muscles and recurrent headaches[30]. There is, however, no evidence that the habit can produce dental changes or malocclusion.

The aetiological factors contributing to fingernail biting may be related to a need for oral gratification. It also appears to be a response to stressful situations. Children may begin nailbiting during times of perceived rejection, when taking examinations and even while watching emotional or stressful programs on television[29].

A punitive approach to the treatment of nailbiting is often ineffective and may actually reinforce the activity. Addressing the underlying emotional problem rather than the habit itself may provide a more sensible approach to managing the problem. In addition to positive reinforcement such as encouraging personal hand grooming and emotional support from peers (eg. parents, teacher), the damage to the nailbeds by the habit may also be treated by the use of appropriate nailcare products to protect the nails.

Mouthbreathing

Continuous mouthbreathing is a relatively uncommon habit in children[24]. Mouthbreathing may be caused by an increased resistance or complete obstruction of normal airflow through the nasal passages, thus forcing the child to breathe through the mouth. Obstruction of respiratory airflow may result from a number of causes. These include allergic reactions producing hypertrophy of the nasal turbinates, chronic infections of the nasal mucosa and enlarged adenoid tissues. Nasal polyps and a deviated septum may also produce respiratory difficulties, but these are more commonly seen in later adulthood. Persistent mouthbreathing may also be caused purely by force of habit, with no associated respiratory obstructions. The child may be unaware of the problem since the habit is often performed at night.

In the past, children who maintained the lips apart at rest with the teeth slightly separated were labelled "mouthbreathers". This classification is no longer widely accepted, however, since an open-lip posture is not a definitive indicator of mouthbreathing and it is possible for individuals to breathe simultaneously through the nose and mouth or through the nose only with the lips separated[20].

Prolonged mouthbreathing can result in dryness of the oral mucosa, thus predisposing the child to dental caries and periodontal problems. This is most evident in the anterior maxillary region. The effects of mouthbreathing on dentofacial development are inconclusive. It has been postulated that mouthbreathing may contribute to a Class II malocclusion and may influence mandibular morphology. The term "adenoid facies" is used to describe a facial pattern commonly associated with mouthbreathers. This is characterised by a dolichofacial skeletal pattern with a long, narrow face and a short upper lip. An anterior open-bite malocclusion is commonly seen in these cases. Despite conflicting theories on whether mouthbreathing itself can produce a malocclusion, current literature suggests that this habit can contribute to maintaining an existing malocclusion[20,29].

The management of mouthbreathing is determined according to the underlying aetiology. Respiratory obstruction may be identified with the aid of airflow studies to determine total nasal and oral airflow. Pathological obstruction of respiratory airflow (eg. due to allergies, chronic infections) may require medical attention. The removal of hyperplastic adenoid tissue has previously been advocated in the correction of mouthbreathing. However, studies have shown that the adenoids seen to produce only a slight increase in the nasal resistance to breathing, and their surgical removal may not necessarily correct the habit[31,32]. The risk of morbidity and mortality with the procedure must also be considered. In

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addition, it has been noted that the habit may be self-correcting as the obstructive effect of the adenoids diminishes as the child matures.
The use of a passive oral screen has been advocated in the correction of habitual mouthbreathing[24,33]. Consisting of a thin acrylic shield which lies in the buccal sulcus, the oral shield prevents mouthbreathing and encourages breathing through the nose. It is generally inserted at night so that the child is made to breathe through the nose while asleep.

Bruxism

Bruxism may be defined as a non-functional grinding or gnashing of the teeth. This is generally considered as a nocturnal habit occurring during sleep, although it may also be observed during the day. Studies have shown that bruxism is a relatively common habit in children, particularly in the primary dentition Stage of development. It has been suggested that a moderate amount of occlusal wear on the primary teeth may be physiologic. Abrasion of the cusp tips on primary teeth may be advantageous as the child moves from the primary dentition to the mixed dentition and on to the permanent dentition. However, in some cases, excessive wear of the teeth can result in exposed dentine and eventual pulpal involvement. Rarely, stainless steel crowns may be necessary to prevent pulpal involvement or to reduce tooth sensitivity. In addition, bruxism may also contribute to TMJ pain and soreness of the muscles of mastication.
Several local, systemic and psychological factors have been proposed in explaining the aetiology of bruxism[34]. Local intra-oral factors such as malocclusion, cuspal interferences and high restorations have been reported to contribute to the habit. Systemic factors include gastrointestinal disorders, subclinical nutritional deficiencies and endocrine disorders. Bruxism is also associated with generalised conditions such as cerebral palsy. Psychological factors proposed in the aetiology of bruxism include underlying personality problems, anxiety states and increased stress.
As with other habits, the management of bruxism involves identification of the aetiology of the activity and focusing treatment based on these findings. In cases where obvious occlusal interferences have been shown to be the cause of bruxism, removal of the interference may be effective. However, recent research by Vanderas et. al. (1995) noted that malocclusion in itself may not necessarily increase the probability of bruxism, and thus early treatment of occlusal conditions to prevent the habit is not scientifically justified[35].
The use of a soft rubber splint worn over the teeth at night may be useful in protecting the teeth and trying to eliminate the habit. The soft rubber does not form a hard and resistant surface for grinding and thus the habit loses its satisfying effectiveness. Tranquillising drugs have been reported to be effective in patients with no obvious psychogenic problems but with some degree of nervousness or restlessness. A treatment of 25mg hydroxyzine (Atarax) 1 hour before bedtime over a period of several months has been reported to be effective in eventual discontinuation of the habit[21]. However, if psychological or underlying systemic problems are suspected in the aetiology of the habit, referral to a child development expert or medical practitioner is necessary.

Conclusion

A wide variety of oral habits may be seen particularly in children. The identification and management of these in children poses a problem for the dental practitioner, especially as some habits may be considered normal in certain stages of the child's development. In the management of self-destructive oral habits, the dental practitioner must take a wholistic approach, recognising the multifactorial aetiology of the condition, with treatment addressed to both physiological and psychological aspects of the behaviour. A multidisciplinary approach may be necessary in certain cases, which could involve psychologists, sociologists, pediatricians, surgeons and other health professionals. The emphasis, therefore, must be on the treatment of the causes and not simply the effects.

References

1. Nilner, M. Functional disturbances and diseases in the stomatognathic system among 7-18 year-olds. Cranio. 1985. 3:358-367.

2. Bayardo, RE; Mejia, JJ; Orozco, S; Montoya, K. Etiology of oral habits. J Dent Child. 1996. 63:350-353.

3. Ingersoll, BD. Behavioural aspects in dentistry. 1982. Appleton-Century-Crofts.

4. Bandura, A. Principles of behaviour modification. 1969. Holt, Rinehart & Winston Inc.

5. Traisman, AS; Traisman, HS. Thumb and fingersucking: a study of 2650 infants and children. J Pedo. 1958. 52:566-572.

6. Benjamin, LS. The beginnings of thumbsucking. Child Develop. 1967. 38:1065-1078.

7. Massler, M; Wood, A. Thumbsucking. J Dent Child. 1949. 16:1-9.

8. Larsson, E. The effect of finger-sucking on the occlusion: a review. Eur J Ortho. 1987. 9:279-282.

9. Fletcher, BT. Etiology of fingersucking: a review of literature. J Dent Child. 1975. 42:293-298.

10. Masssler, M. Oral habits: development and management. J Pedo. 1983. 8:109-119.

11. Haryett, RD; Hansen, FC; Davidson, PO. Chronic thumbsucking: a second report on treatment and its psychological effects. Am J Ortho. 1970. 57:164-178.

12. Haskell, BS; Mink, JR. An aid to stop thumbsucking: the "Bluegrass" appliance. Pediatr Dent. 1991. 13:83-85.

13. Larsson, E. Dummy and fingersucking habits with special attention to their significance for facial growth and occlusion. I. Incidence study. Swedish Dent J. 1971. 64:667-672.

14. Larsson, E. The effect of fingersucking on the occlusion: a review. Euro J Ortho. 1987. 9:279-282.

15. Turgeon-O'Brien, H; Lachapelle, D; Gagnon, PF; Larocque, I; Maheu-Robert, L. Nutritive and non-nutritive sucking habits: a review. J Dent Child. 1996. 63:321-327.

16. Peterson, JE; Schneider, PE. Oral habits: a behavioural approach. Pediatr Clin Nth Am. 1991. 38:1289-1293.

17. Gellin, ME. Digital sucking and tongue thrusting in children. Dent Clin Nth Am. 1978. 22:603-619.

18. Proffit, WR; Manson, RM. Myofunctional therapy for tongue thrusting: background and recommendations. JADA. 1975. 90:403-411.

19. Proffit, WR. Contemporary orthodontics. 2nd Ed. 1993. Mosby-Year Book Inc.

20. Josell, SD. Habits affecting dental and maxillofacial growth and development. Dent Clin Nth Am. 1995. 39:851-860.

21. McDonald, RE; Avery, DR. Dentistry for the child and adolescent. 6th Ed. 1994. Mosby-Year Book Inc.

22. Moyers, RE. Handbook of orthodontics. 4th Ed. 1988. Mosby-Year Book Inc.

23. Barber, TK; Bonus, HW. Dental relationships in tongue thrusting children as affected by circumoral myofunctional exercise. JADA. 1975. 90:979-988.

24. Finn, SB. Clinical Pedodontics. 3rd Ed. 1967. WB Saunders Co.

25. Pinkham, JR. Pediatric dentistry - Infancy through adolescence. 2nd Ed. 1994. WB Saunders Co.

26. Barber, TK. Lip habits in preventive orthodontics. J Prev Dent. 1978. 5:30-34.

27. Moyers, RE. Handbook of orthodontics. 4th Ed. 1988. Mosby-Year Book Inc.

28. Westling, L. Fingernail biting: a literatre review and case reports. Cranio. 1988. 6:182-187.

29. Stewart, RE. Pediatric dentistry - Scientific foundations and clinical practice. 1982. CV Mosby Co.

30. Kleinrok, M. Investigations on the prevalence and treatment of fingernail biting. Cranio. 1996. 8:47-50.

31. Linder-Aronsson, S; Backstrom, A. A comparison between mouth and nose breathers with respect to occlusion and facial dimensions. Eur Ortho Soc. 1960. 36:62-66.

32. Bresolin, D; Shapiro, GG, Shapiro, PA; et. al. Facial characteristics of children who breathe through their mouth. Pediatrics. 1984. 73:622-652.

33. Massler, M; Zwemer, JD. Mouthbreathing. II. Diagnosis and treatment. JADA. 1953. 46:658-670.

34. Kuch, EV; Till, MJ; Messer, LB. Bruxing and non-bruxing children: a comparison of their personality traits. Pediatr Dent. 1979. 1:182-187.

35. Vanderas, AP; Manetas, KJ. Relationship between malocclusion and bruxism in children and adolescents: a review. Pediatr Dent. 1995. 17:7-13.

Society news...from page 3
lively and topical session for all concerned with some animated debate expected as the Constitutional Convention is so much in the news at the moment. It will be held in Toowoomba, over an hours drive from Brisbane, which goes to show country members can play a vital role in our society. We are looking forward to another successful year in 1998.

South Australia

The South Australian Branch has reformed after being in recess for two years. At a dinner meeting held on the 19th August 1997, new office bearers were elected and a committee formed.
The office bearers are:
President: Dr Sue Springbett
Vice President: Dr Margaret Evans
Secretary-Treasurer: Dr Candy Thomas
A final meeting for 1997 is to be held on 28th October 1997. At this meeting, the organising committee for the 12th Biennial Convention of the Federal ANZSPD will be formed and the date for this meeting decided. The 1998 programme will also be finalised. We, will look forward to a resurgence of interest in the Society in South Australia.

Western Australia

The Branch held its Annual General Meeting and Dinner at the Sebel of Perth Hotel in November. The following officers were elected:
President: John Winters
Secretary-Treasurer: Alistair Devlin
Committee Members:
Kate Dyson
Mark Foster
Peter Gregory
Tim Johnston
Peter Readman
The dinner was of the usual high standard for the Hotel, and then this was followed by a fascinating talk by one of the founding fathers of the W.A. Branch, Bill Brogan. He spoke about his underwater diving exploits, being able to draw on about forty years of diving experience. Of course, the talk was illustrated by a remarkable series of slides. Apart from the colourful underwater life, Bill was also able to show photographs of a number of shipwrecks from various parts of the Pacific Ocean. Of great interest were the remains of the vessels of the Japanese Navy of World War II at rest at Truk Island, where the Japanese had a naval base; the other site was the Bikini Atoll, where a large number of ships were sunk as part of the U.S.A. Atomic testing programme in the 1950s.
The branch programme for 1998 will resume (post-A.D.A Congress!) with the Annual Mid-winter Meeting in July at Yallingup in the south-west of the state.

New Zealand

The New Zealand group will meet during the NZDA conference in Wellington in August 1998. The committee is working on having a visiting speaker later in the year also.

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